

**REMARKS**

The Applicants respectfully request further examination and reconsideration in view of the amendments set forth above and the comments set forth below. Within the Office Action, claims 1-54 are pending. Claims 1-5, 7-10, 15, 19-21, 26, 27, 30-34, 36-39, 44, and 48-52 are rejected under 35 U.S.C. § 102, and claims 6, 11-14, 16-18, 22-25, 28, 35, 40-43, 45-47, and 53 are rejected under 35 U.S.C. § 103. Claims 29 and 34 are objected to. By the above amendments, claims 1 and 30 have been amended, and claims 55 and 56 have been added. Accordingly, claims 1-56 are pending.

Rejections under 35 U.S.C. § 102

Within the Office Action, claims 1-5, 7-10, 15, 19-21, 26, 27, 30-34, 36-39, 44, and 48-52 are rejected under 35 U.S.C. § 102 as being anticipated by U.S. Patent No. 5,548,605 to Benett et al. ("Benett"). Specifically, it is stated within the Office Action that "Benett discloses a monolithic micro-channel heat sink comprising all of the applicant's claimed and disclosed limitations of the instant invention." For the reasons given below, the Applicants respectfully traverse these rejections.

Benett is directed to a structure for cooling diode laser bars. Benett discloses a wafer with microchannels formed on a first side of the wafer and diode laser bars inserted into slots sawed into a second side of the wafer. In operation, water flows into the microchannels to cool the diode laser bars. As shown in Figure 3A, the invention of Benett lies in angling the laser diode slots with respect to the cooling channels 30. (Benett, col. 4, lines 66-67) Benett claims that this structure allows diode lasers to be more closely spaced. (*See, e.g., id.* col. 5, lines 10-11) In one embodiment, shown in Figure 3B, the water flow 32 is directed into the cooling channel 30, under the manifold, and out the cooling channel 30.

Benett discloses various configurations for cooling channels. For example, in Figure 3B, the cooling channel 30 is formed of two intersecting slanting walls. The channel 30 thus has a wedge-shaped floor, formed of tapered sides. The channel 30 does not have a substantially planar floor. In Figure 3C, the cooling channels 30 are formed of rectangular trenches. These cooling channels 30 do not narrow. In Figure 4, the cooling channel 62 has a curved floor. In Figure 2A, Benett also shows prior art channels 10 similar to the channel 30 of Figure 3B, also formed by two intersecting slanting walls. In sum, Benett does not teach, suggest, or provide any motivation for a narrowing trench having a substantially planar floor, as recited in the amended independent claims 1 and 30.

In Figure 3C, Benett also discloses a manifold layer 33 with a surface adjacent to a surface of the cooling channels 30. The manifold layer 33 does not extend into the cooling channel 30. Similarly, Figure 4 of Benett discloses a manifold layer 66 with a surface adjacent to a surface of the cooling channels 62. The manifold layer 66 does not extend into the cooling channels 62. Benett does not teach, suggest, or provide any motivation for a manifold having portions that extend into the cooling channels, as recited in the dependent claims 27 and 52 of the present invention

Claims 1-5, 7-10, 19-21, 26, and 27 are allowable over Benett.

The amended independent claim 1 is directed to a method of forming a heat exchanger. The method comprises forming a manifold layer defining a plurality of apertures and forming an interface layer comprising one or more narrowing trenches. Each trench has a substantially planar floor, and each aperture is positioned on one side of a narrowing trench. In this way, a path is defined from a first aperture, through a narrowing trench, and to a second aperture. As described above, Benett does not teach, suggest, or provide any motivation for a narrowing trench with a substantially planar floor. For at least this reason, claim 1 is allowable over the teachings of Benett.

The limitation added to claim 1, “one or more narrowing trenches *each having a substantially planar floor*,” finds support throughout the Specification as filed. For example, at page 7, lines 25-26 of the Specification it is stated; “Each narrowing trench is defined by a sloping sidewall, a substantially planar floor, and a second sloping sidewall.” *See also* Figures 1A and B, 2-4, 7-11, 12B, and 13D.

Claims 2-5, 7-10, 19-21, 26, and 27 all depend from the independent claim 1. As described above, claim 1 is allowable over the teachings of Benett. Accordingly, claims 2-5, 7-10, 19-21, 26, and 27 are all also allowable as depending on an allowable base claim.

Claim 27 is allowable for at least a second reason. Claim 27 depends on claim 1 and further recites, “wherein the manifold layer comprises a surface that extends into each narrowing trench and substantially conforms to a contour of each narrowing trench.” As described above, Benett does not teach, suggest, or provide any motivation for a manifold that extends into a narrowing trench and substantially conforms to a contour of the trench. For at least this additional reason, claim 27 is allowable over the teachings of Benett.

Claims 30-34, 36-39, 44, and 48-52 are also allowable over Benett.

The independent claim 30 is directed to a heat exchanger. The heat exchanger comprises a manifold layer defining a plurality of apertures and an interface layer comprising a plurality of narrowing trenches. Each aperture is positioned on one side of a narrowing trench. Each trench has a substantially planar floor. In this way, a path is defined from a first aperture, through a narrowing trench, and to a second aperture. As described above, Benett does not teach, suggest, or provide any motivation for a narrowing trench with a substantially planar floor. For at least this reason, claim 30 is allowable over the teachings of Benett.

Claims 31-34, 36-39, 44, and 48-52 all depend from the independent claim 30. As described above, claim 30 is allowable over the teachings of Benett. Accordingly, claims 31-34, 36-39, 44, and 48-52 are all also allowable as depending on an allowable base claim.

Claim 52 is allowable for at least a second reason. Claim 52 depends on claim 30 and further recites, “wherein the manifold layer comprises a surface that extends into each trench and substantially conforms to a contour of each narrowing trench.” As described above, Benett does not teach, suggest, or provide any motivation for a manifold that extends into a narrowing trench and substantially conforms to the contour of the trench. For at least this additional reason, claim 52 is allowable over the teachings of Benett.

### Rejections under 35 U.S.C. § 103

#### *Claims 6, 28, 35, and 53*

Within the Office Action, claims 6, 28, 35, and 53 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Benett in view of U.S. Patent No. 6,632,719 to DeBoer et al. (“DeBoer”). Specifically, it is stated within the Office Action that Benett discloses all of the limitations of claims 6, 28, 35, and 53, except (1) using an etchant comprising tetramethyl ammonium hydroxide (TMAH) and (2) having a narrowing trench with a depth:width aspect ratio of at least 10:1. The Applicants respectfully traverse these rejections for several reasons.

First, as described above, claims 1 and 30 are allowable over the teachings of Benett. Claims 6 and 28 both depend on claim 1, and claims 35 and 53 both depend on claim 30. Accordingly, each of the claims 6, 28, 35, and 53 is allowable as depending on an allowable base claim.

Second, claims 6, 28, 35, and 53 are also allowable because DeBoer is non-analogous art

and therefore cannot be relied on to support a rejection under § 103. M.P.E.P. § 2141.01(a), at 2100-115 (8<sup>th</sup> ed. 2001). The Federal Circuit has stated that a reference can be used to reject a claim when it satisfies a two-pronged test: (1) it is in the field of the applicant's endeavor or, if not, (2) it is reasonably pertinent to the problem that the applicant is trying to solve. *In re Oetiker*, 977 F.2d 1443, 1447 (Fed. Cir. 1992) (reversing the rejection of claims by finding that art related to hooks used in garments is not related to a hose clamp). As to the first prong of the test, DeBoer is not in the field of the present invention. DeBoer is directed to "[c]apacitor structures and capacitors with edge zones that are substantially free of hemispherical grain silicon along the upper edges of the capacitor structures." (DeBoer, Abstract) In contrast, the present invention is directed to "A method and apparatus for circulating a cooling material through optimally shaped channels and other geometric structures in a heat exchanger." Specification, page 1, lines 15-16) The fields of endeavor are substantially different.

As to the second prong of the test, forming a capacitor is not pertinent to forming a heat sink. One skilled in the art trying to form a fluid flow path for a heat exchanger would not be motivated to look to the art of forming capacitors. *See, In re Oetiker*, 977 F.2d at 1447. Accordingly, DeBoer is non-analogous art and cannot be used as the basis for a rejection under § 103. For this additional reason, claims 6, 28, 35, and 53 are allowable.

*Claims 16-18, 22-25, and 45-47*

Within the Office Action, claims 16-18, 22-25, and 45-47 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Benett in view of DeBoer "as applied to the claims above," and further in view of U.S. Patent No. 5,310,440 to Zingher ("Zingher"). Specifically, it is stated within the Office Action that Benett discloses all of the claimed limitations except the use and structure of a manifold layer, as recited in claims 16-18 and 45-47, the method for circulating a cooling material, as recited in claim 22, and materials for use as a cooling material, as recited in claims 23-25. The Applicants respectfully traverse these rejections.

Claims 16-18 and 22-25 all depend on claim 1, and claims 45-47 all depend on claim 30. As described above, claims 1 and 30 are both allowable. Accordingly, claims 16-18, 22-25, and 45-47 are all allowable as depending on allowable base claims.

*Claims 11-14 and 40-43*

Within the Office Action, claims 11-14 and 40-43 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Benett in view of DeBoer, “as applied to claims above”, and further in view of U.S. Patent No. 6,437,981 to Newton et al. (“Newton”). Specifically, it is stated within the Office Action that Benett discloses all of the claimed limitations “except for manifold and interface layers being bonded by adhesively bonding; anodic bonding; thermal fusing; and eutectically bonding to each other.” It is further stated within the Office Action that “Newton teaches a pluralities of composite components being bonded by anodic bonding; the pluralities of composite components are bonded with a thermoplastic bonding sheet by thermal fusing; and silicon and glass composite components are bonded to each other (Fig. 17B).” The Applicants respectfully traverse these rejections.

Claims 11-14 all depend on claim 1, and claims 40-43 all depend on claim 30. As described above claims 1 and 30 are both allowable over the teachings of Benett. Accordingly, claims 11-14 and 40-43 are all allowable as depending on an allowable base claim.

Claims 11, 12, and 14 and 40-43 are allowable for a second reason: Claims 11, 12 and 14 recite bonding a manifold layer to the interface layer by, respectively, adhesively bonding, thermally fusing, and eutectically bonding. Contrary to the assertions within the Office Action, Newton does not mention bonding using any of these methods. Claims 11, 12, and 14 are thus allowable over the cited prior art. Similarly, claims 40, 41, and 43 recite bonding a manifold layer to the interface layer by, respectively, adhesively bonding, thermally fusing, and eutectically bonding. Thus, claims 40, 41, and 43 are also allowable for similar reasons.

Allowable Subject Matter

Within the Office Action, it is stated that claims 29 and 54 are objected to as being dependent upon a rejected base claim, but that each would be allowable if rewritten in independent form to include all the limitations of its base claim and any intervening claims.

The new claim 55 recites the limitations of the original claim 29 and the only claim from which it depends, claim 1. Accordingly, the new claim 55 is allowable. The new claim 56 recites the limitations of the original claim 54 and the only claim from which it depends, claim 30. Accordingly, the new claim 56 is also allowable.

Claim 29 depends on claim 1, and claim 54 depends on claim 30. As described above, claims 1 and 30 are both allowable. Accordingly, claims 29 and 54 are also both allowable as

depending on allowable base claims.

**CONCLUSION**

No new matter has been added by the above amendments. For the reasons given above, the Applicants respectfully submit that claims 1-56 are in condition for allowance, and allowance at an early date would be appreciated. If the Examiner has any questions or comments, he is encouraged to call the undersigned at (408) 530-9700 so that any outstanding issues can be expeditiously resolved.

Respectfully submitted,  
HAVERSTOCK & OWENS LLP

Dated: 10-8-04 By: Thomas B. Haverstock

Thomas B. Haverstock  
Reg. No.: 32,571

Attorneys for Applicant

CERTIFICATE OF MAILING (37 CFR§ 1.8(a))

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